

10/730,302

L-F/106DV3

In the Claims

1. (cancelled) A front loadable injector for injecting liquid into the body of an animal, the injector comprising:

a housing;

a pressure jacket carried by the housing and having a cylindrical bore therethrough for receiving a cylindrical syringe therein, the jacket having an open back end communicating with the housing and an open front end for insertion of the syringe into the bore and removal of the syringe from the bore, the bore having a longitudinal axis;

a removable syringe mountable in the bore through the front end of the jacket, the syringe having:

a cylindrical body having open back and front ends,

a forward facing truncated conical front wall located adjacent the front end of the pressure jacket when the syringe is mounted in the bore, the wall having a back end fixed to the front end of the body and a front end, and

a discharge neck fixed to and extending forwardly from the front end of the conical front wall and having a discharge orifice at the front end thereof,

the body, front wall and neck enclosing a fluid-tight cavity communicating between the back end of the

10/730,302

L-F/106DV3

syringe body and the orifice, the body of the syringe having an axis parallel to and in axial alignment with the axis of the bore when the syringe is mounted therein,

a plunger slidably supported in the cavity of the syringe and moveable axially therein between the back end and the front end of the body, the plunger forming a fluid tight seal with the body, the plunger having a forward facing surface forming a moveable rear wall of the cavity and having a rearward facing surface having a drive means engaging coupling thereon located on and symmetrical about the axis of the body;

plunger drive means carried by the housing for axially driving the plunger of a syringe mounted in the bore when engaged with the coupling, the drive means including means extendable through the open back end of the jacket for engaging the coupling upon forward axial movement thereagainst and for otherwise forwardly and rearwardly axially driving the plunger when engaged with the coupling to exert axial force on the plunger, the drive means further including means for engaging the coupling with translational relative movement toward the axis of the body and for disengaging the coupling with translational relative movement away from the axis of the body; and

10/730,302

L-F/106DV3

means, carried in part by the syringe near the conical front wall thereof and in part by the pressure jacket near the front end thereof, for releasably securing the syringe to the pressure jacket.

2. (cancelled) The injector of claim 1 further comprising:

means carried in part by the housing and in part by structure carried by the syringe for orienting the syringe in a predetermined angular orientation with respect to the housing when the syringe is secured to the pressure jacket.

3. (cancelled) The injector of claim 2 wherein:
the orienting means includes at least some structure in common with the securing means.

4. (cancelled) The injector of claim 3 wherein:
the common structure of the syringe orienting means and the securing means includes cooperating thread segments including segments fixed to the jacket near the front end thereof and mating segments fixed to the syringe near the front wall thereof.

5. (cancelled) The injector of claim 4 wherein:

10/730,302

L-F/106DV3

the thread segments fixed to the jacket are radially outwardly projecting and the mating thread segments fixed to the syringe are radially inwardly projecting.

6. (cancelled) The injector of claim 3 wherein:

the securing means includes means operative upon the rotation of the syringe with respect to the housing about the axis of the jacket, for locking the syringe respectively to the jacket at the predetermined angular orientation and for unlocking the syringe from the jacket.

7. (cancelled) The injector of claim 6 further comprising:

means carried by, and mounted for movement in relation to, the housing for rotating the syringe with respect to the housing between the predetermined angular orientation at which the syringe is locked to the jacket and an unlocked orientation at which the syringe is removable from the bore.

8. (cancelled) The injector of claim 6 wherein:

the orienting means includes at least some structure in common with the rotating means.

10/730,302

L-F/106DV3

9. (cancelled) The injector of claim 8 wherein:

the syringe has at least one notch in the back end thereof and the common structure of the orienting means and the rotating means includes at least one key carried by the housing and insertable into the notch when the syringe is in a unique angular orientation with respect to the housing.

10. (cancelled) The injector of claim 1 wherein:

the securing means includes means for rotating the syringe with respect to the jacket about the axis of the jacket between a locking orientation for locking the syringe to the jacket when the syringe is mounted in the jacket, and an unlocking orientation for unlocking the syringe for mounting in and removal from the jacket.

11. (cancelled) The injector of claim 10 wherein:

the syringe has at least one notch in the back end thereof and the rotating means includes at least one key carried by the housing and insertable in the notch when the syringe is mounted in the bore.

10/730,302

L-F/106DV3

12. (cancelled) The injector of claim 1 wherein:

the securing means includes means operative upon the movement thereof with respect to the housing for imparting relative translational movement between the drive means and the axis of the body of the syringe.

13. (cancelled) The injector of claim 12 wherein:

the syringe has at least one notch in the back end thereof and the movement imparting means includes at least one a key carried by the housing and insertable in the notch when the syringe is mounted in the bore.

14. (cancelled) The injector of claim 12 wherein:

the movement imparting means is moveable between the lock position at which the drive means engages the coupling and the unlock position at which the drive means is disengaged from the coupling.

15. (cancelled) The injector of claim 12 wherein:

the housing carries a door portion openably mounted thereto, the jacket being carried by the door; and

10/730,302

L-F/106DV3

the movement imparting means is further moveable to a release position at which the door can be opened and closed to permit access to the back end of the jacket.

16. (cancelled) The injector of claim 15 wherein the movement imparting means includes:

means for locking the door closed when the movement imparting means is in its locked and unlocked positions; and

means for relatively translating the coupling engaging means and the coupling into and out of engagement upon movement of the movement imparting means respectively to and from its release position.

17. (cancelled) The injector of claim 1 wherein:

the syringe has a pressure retaining cap secured thereto and overlying the forward facing side of the conical front wall thereof.

18. (cancelled) The injector of claim 17 wherein:

the securing means is carried at least in part by the cap.

10/730,302

L-F/106DV3

19. (cancelled) The injector of claim 1 further comprising:

means carried in part by the housing and in part by the syringe for orienting a the syringe in a predetermined first angular orientation with respect to the housing when the syringe is secured to the pressure jacket; and

the coupling and drive means are engageable for movement of the syringe to and from in the predetermined first angular orientation.

20. (cancelled) The injector of claim 19 wherein:

the securing means includes means operative upon the movement thereof with respect to the housing for imparting relative rotational movement between the drive means about the axis of the body of the syringe to rotate the syringe between the predetermined first angular orientation at which the coupling is engaged with the drive means and a second angular orientation at which the coupling is disengaged from the drive means.

21. (cancelled) An injector for injecting liquid into the body of an animal, the injector comprising:

an injector unit having a jacket supported thereto, the jacket having a bore extending longitudinally therethrough, an

10/730,302

L-F/106DV3

open front end for receiving in the bore a replaceable syringe,
and a back end having a plunger drive receiving opening therein;

a replaceable syringe removeably mountable in the bore,
the syringe having a front end and a back end, a fluid discharge
orifice at the front end thereof and an opening in the back end
thereof;

the syringe having a longitudinally extending body
insertable into the jacket and dimensioned generally to conform
to the bore, a fluid holding cavity therein at least partly
contained in the body, and a plunger slidably mounted in the body
for expressing fluid from, and drawing fluid into, the cavity
through the orifice upon the longitudinal movement of the
plunger;

the unit including a plunger drive carried thereby and
longitudinally extendable through the opening in back end of the
jacket, and through the opening in the back end of a syringe when
the syringe is mounted in the bore of the jacket, the drive
having thereon a plunger engaging element engageable with the
plunger when the syringe is inserted in the bore to
longitudinally move the plunger forward and rearward in the bore;
and

locking structure carried at least partially by the
syringe near the front end thereof, the locking structure being

10/730,302

L-F/106DV3

lockable to the jacket proximate the front end thereof to lock the syringe in the jacket while the liquid is being injected.

22. (cancelled) The injector of claim 21 wherein:
the locking structure includes a pressure retaining cap at the front end of the syringe having a rim securable to the front end of the pressure jacket.

23. (cancelled) The injector of claim 22 wherein:
the cap is formed of material separate from the body of the syringe.

24. (cancelled) The injector of claim 21 wherein:
the locking structure includes mating locking members, including at least one carried by the syringe and at least one carried by the pressure jacket, configured and positioned to secure and release the syringe to and from the jacket upon the relative movement of members with respect to each other.

25. (cancelled) The injector of claim 24 further comprising:
a relative movement imparting mechanism connectable between the syringe and the unit when the syringe is mounted in

10/730,302

L-F/106DV3

the jacket, the mechanism being operable to impart relative movement between the locking members of the syringe and the jacket to lock the syringe to and unlock the syringe from the jacket.

26. (cancelled) The injector of claim 25 wherein:

the movement imparting mechanism is operable to impart relative movement between the plunger engaging element of the plunger drive and the plunger to relatively move the plunger engaging element into and out of driving engagement with the plunger.

27. (cancelled) The injector of claim 26 wherein:

the relative movement between the locking members is rotational and the relative movement between the plunger and the plunger engaging element is transverse.

28. (cancelled) The injector of claim 27 wherein:

the transverse movement between the locking members is rotational movement about an axis parallel to the jacket bore.

10/730,302

L-F/106DV3

29. (cancelled) The injector of claim 28 wherein:

the transverse movement between the plunger and plunger engaging element is translatory movement with respect to the axis of the bore.

30. (cancelled) The injector of claim 27 wherein:

the transverse movement between the plunger and plunger engaging element is rotational movement about an axis parallel to the jacket bore.

31. (cancelled) The injector of claim 21 further comprising:

means carried in part by the unit and in part by the syringe for restricting the permissible angular orientation of the syringe with respect to the unit when the syringe is mounted in the bore of the jacket.

32. (cancelled) A disposable replacement syringe for a front loadable injector for injecting liquid into an animal at a predetermined operating pressure, and which has a pressure jacket having a longitudinal cylindrical internal bore in which a syringe is supported surrounded by a pressure withstanding side wall for restraining the syringe supported therein against radial

10/730,302

L-F/106DV3

expansion when filled with liquid at the predetermined operating pressure, and having an open front end through which a syringe is loadable into and unloadable from the bore and locking structure proximate the front of the jacket, the injector having a plunger drive longitudinally moveable in the bore, the syringe comprising:

a hollow tubular body having a liquid holding cavity at least partially enclosed therein, a back end with an opening therein and a front end, the body being outwardly deformable at the predetermined operating pressure and configured and dimensioned to form a pressure contact with the jacket when received in the bore thereof and when liquid at the predetermined operating pressure is contained within the cavity, the back end having a flangeless outer periphery configured and dimensioned to pass through the front end of the jacket;

a forward facing front wall at the front end thereof and sufficiently strong to resist substantial deformation and rupturing when liquid at the predetermined pressure is contained within the cavity, the front wall having a liquid discharge outlet thereon;

a plunger slidably supported in the cavity and moveable longitudinally therein between the back end and the front end of the body, the plunger forming a fluid tight seal with the body,

10/730,302

L-F/106DV3

the plunger having a forward facing surface forming a moveable rear wall of the cavity and a rearward facing surface having a drive engaging coupling thereon positioned and configured to be engageable by the plunger drive through the opening at the back end of the syringe when the syringe is supported in the bore;

means, carried by the syringe proximate the front wall thereof, for releasably securing the syringe to the pressure jacket and for forming a connection therebetween sufficiently strong to retain the syringe in the pressure jacket when the plunger drive advances the plunger within the tubular body and the pressure of the liquid in the cavity reaches the predetermined operating pressure.

33. (cancelled) The syringe of claim 32 for an injector wherein the bore of the jacket of the injector is cylindrical and has a longitudinal axis, wherein:

the syringe body is cylindrical;

the forward wall of the syringe has a truncated cone having its large end fixed to the front end of the syringe body and its small end extending forward; and

the syringe has a discharge neck sealed to and extending from the small end of the forward wall, the neck having a discharge orifice at the front end thereof ;

10/730,302

L-F/106DV3

the body, front wall and neck enclosing a fluid-tight cavity communicating between the back end of the syringe and the orifice.

34. (cancelled) The syringe of claim 32 for an injector having a housing, the syringe further comprising:

means carried thereby for orienting the syringe in a predetermined angular orientation with respect to the housing when the syringe is secured to the jacket.

35. (cancelled) The syringe of claim 34 wherein:

the orienting means includes at least one notch in the back end of the syringe body.

36. (cancelled) The syringe of claim 34 wherein:

the orienting means includes three unequally spaced notches in the back end of the syringe body.

37. (cancelled) The syringe of claim 32 wherein:

the securing means includes thread structure fixed to the syringe proximate the front end of the body thereof.

38. (cancelled) The syringe of claim 37 wherein:

10/730,302

L-F/106DV3

the thread segments are radially inwardly projecting.

39. (cancelled) The syringe of claim 32 wherein:

the securing means includes means operative upon the rotation of the syringe with respect to the jacket for locking and unlocking the syringe respectively to and from the jacket.

40. (cancelled) The syringe of claim 39 further comprising:

means carried thereby for engaging a mechanism carried by the injector and rotating the syringe with respect to the jacket.

41. (cancelled) The syringe of claim 32 wherein:

the syringe has a pressure retaining cap secured thereto and overlying the front wall on the forward facing side thereof.

42. (cancelled) The syringe of claim 41 wherein:

the securing means is carried by the cap.

43. (cancelled) The syringe of claim 32 further comprising:

10/730,302

L-F/106DV3

a coupling carried by the plunger; and
the coupling and drive being engageable and
disengageable upon the rotation of the coupling with respect to
the drive.

44. (cancelled) The syringe of claim 32 further
comprising:

means proximate the front end of the body thereof for
diverting fluid away from the space between the jacket and the
syringe.

45. (cancelled) A disposable replacement syringe for a
front loadable injector for injecting liquid into an animal at a
predetermined operating pressure, and which has a pressure jacket
having a longitudinal cylindrical internal bore in which a
syringe is supported surrounded by a pressure withstanding side
wall for restraining the syringe supported therein against radial
expansion when filled with liquid at the predetermined operating
pressure, and having an open front end through which a syringe is
loadable into and unloadable from the bore and stationary locking
structure proximate the front of the jacket, the injector having
a plunger drive longitudinally moveable in the bore and a

10/730,302

L-F/106DV3

rotational locking mechanism at the back end of the jacket, the syringe comprising:

a hollow cylindrical body having a fluid holding cavity at least partially contained therein, a front end, and a back end;

the back end of the syringe having a flangeless outer periphery configured and dimensioned to fit through the open front end of the jacket, a plunger drive receiving opening therethrough and at least one notch in the periphery thereof;

the body being configured and dimensioned to approximately contact the jacket when loaded in the bore, and to be rotatable within the bore when the cavity is at ambient pressure by engagement of the notch by the locking mechanism;

a pressure restraining front wall sealed to the front end of the body and having a fluid discharge outlet therethrough that communicates with the cavity, the front wall being sufficiently strong to withstand liquid in the syringe at the predetermined operating pressure;

a plunger slidably supported in the body and moveable longitudinally therein between the back end and the front end of the body, the plunger forming a fluid tight seal with the body, the plunger having a forward facing surface forming a moveable rear wall of the cavity and having a rearward facing surface

10/730,302

L-F/106DV3

having a drive engaging coupling positioned thereon and configured to be engageable by the plunger drive through the opening at the back end of the syringe when the syringe is loaded in the bore; and

locking structure carried by the syringe proximate the front end thereof and structurally connected to the front wall of the syringe, the locking structure being engageable with the stationary locking structure of the pressure jacket to hold the syringe, when the plunger drive advances the plunger within the cavity and the pressure of the liquid in the cavity reaches the predetermined operating pressure, in pressure retaining engagement with the jacket when locked thereto, the locking structure being locked and unlocked by the rotation of the syringe in the bore upon rotation of the locking mechanism engaged with the notch.

46. (cancelled) The syringe of claim 45 wherein:

the locking structure includes a pressure retaining cap fixed to the front end of the syringe body, the cap having an outer periphery securable to the front end of the pressure jacket.

47. (cancelled) The syringe of claim 46 wherein:

10/730,302

L-F/106DV3

the cap is formed of material separate from the body of the syringe.

48. (cancelled) The syringe of claim 45 wherein:
the locking structure includes threads configured to cooperate with mating threads on the jacket.

49. (cancelled) The syringe of claim 45 further comprising:
orienting structure configured to cooperate with structure carried by the housing so as to restrict the possible angular orientations at which the syringe can be supported in the bore of the jacket.

50. (cancelled) The syringe of claim 49 wherein the orienting structure includes:
structure located proximate the back end of the syringe configured to cooperate, when the syringe is loaded in the bore of the jacket, with structure carried by the housing proximate the back end of the jacket.

10/730,302

L-F/106DV3

51. (cancelled) The syringe of claim 49 wherein:

the orienting structure includes threads configured to cooperate with mating threads on the jacket.

52. (cancelled) The syringe of claim 51 wherein:

the threads on the syringe and on the jacket each include four thread sections equally spaced around the body of the syringe.

53. (cancelled) The syringe of claim 49 wherein:

the angular orientation determining surfaces include three notches unequally spaced around the back edge of the body of the syringe.

54. (cancelled) The syringe of claim 45 wherein:

the coupling extends rearwardly from the center of the rearward facing surface of the plunger and has an enlarged end configured to remain in driving engagement with the drive to move longitudinally therewith and to disengage the drive only upon relative transverse movement of the coupling with respect to the drive.

10/730,302

L-F/106DV3

55. (cancelled) The syringe of claim 54 wherein:

the coupling is axially symmetrical about the center of the rearward facing surface of the plunger and is thereby disengageable from the drive only upon relative translational movement of the coupling with respect to the drive.

56. (cancelled) The syringe of claim 54 wherein:

the coupling is axially asymmetrical about the center of the rearward facing surface of the plunger and is thereby disengageable from the drive upon relative rotational movement of the coupling with respect to the drive.

57. (cancelled) The syringe of claim 45 wherein:

the syringe includes movement imparting structure configured to cooperatively engage a mechanism carried by the housing to move the syringe with respect to the housing to lock the syringe to the jacket.

58. (cancelled) The syringe of claim 57 wherein:

the coupling is configured to engage and disengage the plunger drive upon movement of the syringe with respect to the jacket that is imparted through the engagement of the coupling and plunger drive.

10/730,302

L-F/106DV3

59. (cancelled) The syringe of claim 58 wherein:

the movement of the syringe with respect to the jacket is rotational movement and is combined with rotational movement of the plunger drive with respect to the coupling.

60. (cancelled) The syringe of claim 58 wherein:

the movement of the syringe with respect to the jacket is rotational movement and is combined with translational movement of the plunger drive with respect to the coupling.

61. (cancelled) The syringe of claim 55 wherein:

the translational movement of the plunger drive with respect to the coupling is transverse translational movement.

62. (cancelled) A disposable replacement syringe for a front loadable injector for injecting liquid into an animal at a predetermined operating pressure, and which has a jacket having a longitudinal cylindrical internal bore in which a syringe is supported surrounded by a side wall for supporting a syringe therein against radial expansion when filled with liquid at the predetermined operating pressure, and having an open front end through which a syringe is loadable into and unloadable from the bore and locking structure proximate the front of the jacket, the

10/730,302

L-F/106DV3

injector having a plunger drive longitudinally moveable in the bore, the syringe comprising:

a hollow tube having a fluid holding cavity at least partially contained therein, a front end, and a back end;

the back end of the tube having a flangeless outer periphery configured and dimensioned to fit through the open front end of the jacket and a plunger drive receiving opening therethrough;

the tube being configured and dimensioned to fit within the jacket when loaded in the bore thereof when liquid at operating pressure is contained within the cavity, and to be slidable within the bore;

a pressure restraining front wall sealed to the front end of the tube and having a liquid discharge outlet therethrough that communicates with the cavity, the front wall being sufficiently strong to withstand liquid in the syringe at the predetermined operating pressure;

a plunger slidably supported in the tube and moveable longitudinally therein between the back end and the front end of the tube, the plunger forming a fluid tight seal with the tube, the plunger having a forward facing surface forming a moveable rear wall of the cavity and having a rearward facing surface having a drive engaging coupling positioned thereon and

10/730,302

L-F/106DV3

configured to be engageable by the plunger drive through the opening at the back end of the syringe when the syringe is loaded in the bore; and

means carried by the syringe near the front end thereof for engaging the locking structure of the jacket and forming a connection between the front wall of the syringe and the locking structure of the jacket to hold the syringe in engagement with the jacket when the plunger drive advances the plunger within the tube and the pressure of the liquid in the cavity reaches the predetermined operating pressure.

63. (cancelled) A front loadable injector for injecting fluid into the body of an animal, the injector comprising:

a housing;

a pressure jacket carried by the housing and having a bore therethrough for receiving a cylindrical syringe therein, the jacket having an open front end for insertion of the syringe into the bore and removal of the syringe from the bore, the bore having a longitudinal axis;

a removable syringe mountable in the bore through the front end of the jacket;

a pressure restraining front wall and means, carried in part by the front wall and in part by the pressure jacket

10/730,302

L-F/106DV3

proximate the front end thereof, for releasably securing the syringe to the pressure jacket;

the syringe having a body portion insertable into the bore of the pressure jacket, the body portion having an interior surface;

a plunger slidably supported in the cavity of the syringe and moveable axially therein, the plunger having a drive means engaging coupling thereon;

plunger drive means carried by the housing and longitudinally extendable in the bore from the back end of the jacket for axially driving the plunger of a syringe mounted in the bore; and

the jacket and syringe being dimensioned and configured to prevent contact between the interior surface of the body of the syringe and the drive means as the syringe is being inserted in the bore.

64. (cancelled) A method of loading a syringe in an injector having a pressure jacket with a bore therethrough and an open front end, wherein the syringe has a hollow tubular body, a plunger slidably mounted in the body that has a drive engaging coupling on rearwardly extending therefrom, a back end and a

10/730,302

L-P/106DV3

pressure restraining front end that has a fluid dispensing orifice therein, the method comprising the steps of:

inserting the body of the syringe longitudinally into the bore of the jacket, back end first, through the open front end of the jacket, with the body of the syringe in pressure restraining relationship with the jacket while the drive is at an extended position in the bore;

connecting the front end of the syringe to the front end of the jacket;

translating the drive transversely with respect to the coupling from the extended position and into drivable engagement with the coupling;

retracting the drive to retract the plunger and thereby filling the syringe with fluid drawn in through the orifice.

65. (cancelled) A method of removing a syringe from an injector having a jacket with a bore therethrough and an open front end, the syringe having a hollow body mounted in the bore of the jacket, a plunger slidably mounted in the body, a back end and a pressure restraining front end that is connected to the front end of the jacket and has a liquid dispensing orifice therein, wherein the syringe has an injection tube connected to at the orifice, the method comprising the steps of:

10/730,302

L-F/106DV3

disconnecting the front end of the syringe from the front end of the jacket; and

removing the body of the syringe from the bore of the jacket, through the open front end of the jacket, without disconnecting the tube from the orifice of the syringe.

66. (cancelled) A method of inserting a syringe into an injector having a jacket with a syringe receiving space at least partially surrounded thereby and an open front end, the method comprising the steps of:

providing a syringe having a hollow body, a plunger slidably mounted in the body, a back end and a pressure restraining front end that has a fluid dispensing orifice therein;

inserting the body of the syringe into the bore of the jacket, back end first, through the open front end of the jacket; and

connecting the front end of the syringe to the front end of the jacket.

67. (cancelled) The method of claim 66 further comprising the steps of:

10/730,302

L-F/106DV3

simultaneous with the connecting of the front end of the syringe with the front end of the jacket, connecting the coupling to the drive.

68. (cancelled) The method of claim 67 wherein:

the connecting steps include the step of rotating the syringe with respect to the jacket.

69. (cancelled) The method of claim 67 wherein:

the coupling and drive connecting step includes the step of translating the syringe with respect to the drive; and
the syringe front end and jacket front end connecting step includes the step of rotating the syringe with respect to the jacket.

70. (renumbered, formerly claim 71.) (cancelled) The method of claim 67 wherein:

the coupling and drive connecting step includes the step of transversely translating the syringe with respect to the drive; and

the syringe front end and jacket front end connecting step includes the step of rotating the syringe with respect to the jacket.

10/730,302

L-F/106DV3

71. (renumbered, formerly claim 72.) (cancelled) The method of claim 66 further comprising the steps of:

disconnecting the front end of the syringe from the front end of the jacket.

72. (renumbered, formerly claim 73.) (cancelled) The method of claim 71 [[72]] further comprising the steps of:

simultaneous with the disconnecting of the front end of the syringe from the front end of the jacket, disconnecting the coupling from the drive.

73. (renumbered, formerly claim 74.) (cancelled) The method of claim 72 [[73]] wherein:

the disconnecting steps include the step of rotating the syringe with respect to the jacket.

74. (renumbered, formerly claim 75.) (cancelled) The method of claim 71 [[72]] wherein:

the coupling and drive disconnecting step includes the step of transversely translating the syringe with respect to the drive; and

10/730,302

L-F/106DV3

the syringe front end and jacket front end disconnecting step includes the step of rotating the syringe with respect to the jacket.

75. (renumbered, formerly claim 76.) (cancelled) A method of replacing a first syringe that is secured to a pressure jacket of an injector with a second syringe, the injector having a plunger drive carried thereby and each syringe a plunger moveable therein with a drive engaging coupling thereon, the first syringe being initially engaged with the pressure jacket and the coupling of the first syringe being initially engaged with the plunger drive, the method comprising the steps of:

moving the first syringe with respect to and out of engagement with the pressure jacket and simultaneously moving the coupling of the first syringe with respect to and out of engagement with the plunger drive;

removing the first syringe from the pressure jacket and inserting the second syringe into the pressure jacket; and

moving the second syringe with respect to and into engagement with the pressure jacket and simultaneously moving the coupling of the second syringe with respect to and into a position for engagement with the plunger drive.

10/730,302

L-F/106DV3

76. (renumbered, formerly claim 77.) (cancelled) The method of claim 75 [[76]] wherein:

the movements of the syringes with respect to the jacket are rotational movements.

77. (renumbered, formerly claim 78.) (cancelled) The method of claim 75 [[76]] wherein:

the movements of the couplings with respect to the drive are rotational movements.

78. (renumbered, formerly claim 79.) (cancelled) The method of claim 75 [[76]] wherein:

the movements of the couplings with respect to the drive are transverse translational movements.

79. (renumbered, formerly claim 80.) (cancelled) The method of claim 75 [[76]] for an injector having a jacket with an open front end, and wherein:

the removal and insertion of the syringes from and into the jacket include the respective steps of removing and inserting the syringe from and into the jacket through the open front end of the jacket.

10/730,302

L-F/106DV3

80. (renumbered, formerly claim 81.) (cancelled) The method of claim 75 [[76]] wherein:

the movements of the couplings with respect to the drive and the movements of the syringe with respect to the jacket are linked to the movement of a common component of the injector.

81. (renumbered, formerly claim 82.) (cancelled) A disposable replacement syringe for a front loadable injector for injecting liquid into an animal at a predetermined operating pressure, and which has a pressure jacket having a longitudinal internal bore in which a syringe is supported surrounded by a pressure withstanding side wall for restraining the syringe supported therein against radial expansion when filled with liquid at the predetermined operating pressure, and having an open front end through which a syringe is loadable into and unloadable from the bore and locking structure proximate the front of the jacket, the injector having a plunger drive longitudinally moveable in the bore, the syringe comprising:

a hollow tube having a fluid holding cavity at least partially contained therein, a front end, and a back end, the tube being outwardly deformable when liquid at the predetermined operating pressure is contained within the cavity;

10/730,302

L-F/106DV3

a pressure restraining front wall sealed to the front end of the tube and having liquid discharge outlet therethrough that communicates with the cavity, the front wall being sufficiently strong to withstand liquid in the syringe at the predetermined operating pressure.

82. (renumbered, formerly claim 83.) (cancelled) The syringe of claim 81 [[82]] wherein:

the back end of the jacket has at least one notch therein.

83. (renumbered, formerly claim 84.) (cancelled) The syringe of claim 81 [[82]] wherein:

the tube has a flangeless back end and a uniform cross-sectional diameter; and

the syringe includes means proximate the front end thereof for locking the syringe to the pressure jacket and forming a connection between the front wall of the syringe and the pressure jacket to hold the syringe in the jacket when liquid is contained in the syringe at the predetermined operating pressure.

10/730,302

L-F/106DV3

84. (renumbered, formerly claim 85.) (cancelled) The syringe of claim 81 [[82]] wherein:

the front wall of the syringe is dimensioned and configured to extend around the front end of the pressure jacket around the periphery thereof.

85. (renumbered, formerly claim 86.) (cancelled) A disposable replacement syringe for a front loadable injector for injecting liquid into an animal at a predetermined operating pressure, and which has an outer jacket having an open front end through which a syringe is loadable and unloadable and locking structure proximate the front of the jacket, and having external threads at the front end of the jacket, the injector having a plunger drive longitudinally moveable in the bore, the syringe comprising:

a hollow tube having a fluid holding cavity at least partially contained therein, a front end, and a back end;

a front wall sealed to the front end of the tube and having liquid discharge outlet therethrough that communicates with the cavity, the front wall having an outer rim and being configured and dimensioned to extend around the front end of the jacket when the syringe is supported therein with the rim encircling the front end of the jacket; and

10/730,302

L-F/106DV3

internal threads on the rim of the front wall engageable with the threads of the pressure jacket.

86. (renumbered, formerly claim 87.) (cancelled) A method of replacing a first syringe with a second syringe in an injector having a pressure jacket with a bore therethrough and an open front end, wherein each of the syringes has a hollow body, a plunger slidably mounted in the body that has a drive engaging coupling on rearwardly extending therefrom, a back end and a pressure restraining front end that has a fluid dispensing orifice therein, the method comprising the steps of:

disconnecting the coupling of the first syringe from the drive means while the drive means is extended substantially into the bore;

disconnecting the front end of the first syringe from the front end of the jacket and, with the drive substantially extended in the bore and without retracting the drive in the bore, removing the body of the first syringe from the bore of the jacket through the front end thereof;

inserting the body of the second syringe into the bore of the jacket, back end first, through the open front end of the jacket, with the body of the syringe in pressure restraining relationship with the jacket;

10/730,302

L-F/106DV3

detachably connecting the front end of the second syringe to the front end of the jacket; and
connecting the drive to the coupling of the second syringe.

87. (renumbered, formerly claim 88.) (cancelled) The method of claim 86 [[87]] wherein:

the body inserting step occurs with the drive substantially extended in the bore.

88. (renumbered, formerly claim 89.) (cancelled) A front loadable injector for injecting liquid into the body of an animal at an operating pressure, the injector comprising:

a pressure jacket having a bore therethrough for receiving a syringe therein, the jacket having an open front end for insertion of the syringe into the bore and removal of the syringe from the bore and a pressure restraining side wall, the front end of the jacket having no pressure restraining capability, the bore having a longitudinal axis;

a removable syringe mountable in the bore through the front end of the jacket, the syringe having a hollow body having a pressure restraining front wall and a tubular body outwardly deformable when containing liquid at operating pressure; and

means, carried in part by the syringe proximate the conical front wall thereof and in part by the pressure jacket proximate the front end thereof, for releasably forming a force restraining connection between the syringe front wall and the front end of the pressure jacket to hold the syringe in the pressure jacket when the plunger drive advances the plunger within the body and the pressure of the liquid in the cavity reaches the operating pressure.

89. (renumbered, formerly claim 90.) (cancelled) A disposable replacement syringe for a front loadable injector for injecting liquid into an animal at a predetermined operating pressure, and which has an outer jacket, having an open front end through which a syringe is loadable and unloadable, the syringe comprising:

a hollow tube having a fluid holding cavity at least partially contained therein, a front end, and a back end; and

a front wall sealed to the front end of the tube and having liquid discharge outlet therethrough that communicates with the cavity, the front wall having an outer rim and being configured and dimensioned to extend around the front end of the jacket when the syringe is supported therein with the rim encircling the front end of the pressure jacket.

10/730,302

L-F/106DV3

90. (Currently amended) A syringe holder for holding a syringe installed into a front loadable injector, the holder comprising:

a section defining a cylindrical bore for receiving a cylindrical syringe therein, an open back end for communicating with an injector housing and an open front end for insertion of the syringe into the bore and removal of the syringe from the bore;

~~an annular flange extending radially outwardly around said back end and integrally formed with the holder,~~
~~an annular tab extending radially outwardly from said annular flange and integrally formed with the holder, and~~
~~an annular recess defined in said annular flange and extending radially inwardly from an outer surface of said annular flange adjacent said back end~~

the section further defining an internal annular recess in communication with said bore at a forward end of said holder, for receiving and retaining connecting structure of a syringe.

91. (Previously Presented) The syringe holder of claim 90 wherein said syringe holder is a pressure jacket for receiving said syringe and supporting said syringe against expansion from fluid pressure within said syringe.

10/730,302

L-F/106DV3

92. (Currently amended) The syringe holder of claim 90 combined with a front loading syringe, the syringe comprising a body having an open back end and a front end, the body fittable within the cylindrical bore of the holder;

a forward facing truncated conical front wall located adjacent the front end of the syringe, the wall having a back end fixed to the front end of the body and a front end;

a discharge neck fixed to and extending forwardly from the front end of the conical front wall and having a discharge orifice at the front end thereof;

a radially outwardly extending flange on said body and in engagement with said internal annular recess of said holder section;

the body, front wall and neck enclosing a fluid-tight cavity communicating between the back end of the syringe body and the orifice, the body of the syringe having an axis parallel to and in axial alignment with the axis of the bore when the syringe is mounted therein; and

a plunger slidably supported in the cavity of the syringe and moveable axially therein between the back end and the front end of the body, the plunger forming a fluid tight seal with the body, the plunger having a forward facing surface forming a moveable rear wall of the cavity and having a rearward facing

10/730,302

L-P/106DV3

surface having a drive means engaging coupling thereon ~~located on~~
~~and symmetrical about the axis of the body.~~

93. (Currently amended) A method of installing a syringe in a front loadable injector, comprising:

providing a syringe holder for holding a syringe installed into a front loadable injector, the holder comprising a section defining a cylindrical bore for receiving a cylindrical syringe therein, an open back end for communicating with an injector housing and an open front end for insertion of the syringe into the bore and removal of the syringe from the bore, and an internal annular recess in communication with said bore at a forward end of said holder, for receiving and retaining connecting structure of a syringe ~~an annular flange extending radially outwardly around said back end and integrally formed with the holder;~~

installing said holder into a face plate having an aperture extending therethrough, ~~by insertion of said open front end of holder into said aperture from a rear surface of said face plate, engaging said annular flange of said holder with said face plate;~~

installing said face plate to said front loadable injector by mounting said rear surface of said face plate adjacent to a housing of said injector;

10/730,302

L-F/106DV3

providing a front-loadable syringe having a cylindrical body; and

installing said front-loadable syringe into said holder by insertion of said cylindrical body of said syringe into said open front end of said bore of said holder.

94. (Currently amended) The method of claim 93 wherein said syringe holder further comprises:

an annular flange extending radially outwardly around said holder back end and integrally formed with the holder

~~an annular tab extending radially outwardly from said annular flange and integrally formed with the holder; and~~

~~an annular recess defined in said annular flange and extending radially inwardly from an outer surface of said annular flange.~~

95. (New) The method of claim 93 wherein said syringe holder further comprises:

an annular tab extending radially outwardly from said annular flange and integrally formed with the holder; and

an annular recess defined in said annular flange and extending radially inwardly from an outer surface of said annular flange.

10/730,302

L-F/106DV3

96. (Previously Presented) The method of claim 93 wherein said syringe holder is a pressure jacket for receiving said syringe and supporting said syringe against expansion from fluid pressure within said syringe.

97. (Currently amended) The method of claim 93 wherein said syringe further comprises:

a forward facing truncated conical front wall located adjacent the front end of the syringe, the wall having a back end fixed to the front end of the body and a front end;

a discharge neck fixed to and extending forwardly from the front end of the conical front wall and having a discharge orifice at the front end thereof;

a radially outwardly extending flange on said body and engageable to said internal annular recess of said holder section;

the body, front wall and neck enclosing a fluid-tight cavity communicating between the back end of the syringe body and the orifice, the body of the syringe having an axis parallel to and in axial alignment with the axis of the bore when the syringe is mounted therein; and

a plunger slidably supported in the cavity of the syringe and moveable axially therein between the back end and the front

10/730.302

L-F/106DV3

end of the body, the plunger forming a fluid tight seal with the body, the plunger having a forward facing surface forming a moveable rear wall of the cavity and having a rearward facing surface having a drive means engaging coupling thereon ~~located on and symmetrical about the axis of the body.~~